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(54) Title of Utility Model: Bank Note Discriminating Device

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(57) Claims

A bank note discriminating device, wherein the bank note discriminating device comprises a light source for illuminating the red seal on the surface of the bank note to be identified and the underlying area surrounding the red seal with a uniform amount of light, a filter for removing the red light from the light reflected back from the red seal and the underling area, a light-receiving element for receiving the reflected light passed through the filter, a comparison circuit for comparing the signals outputted from the light-receiving element and outputting the signals corresponding to the difference between the signals, and a determining means for determining whether or not the signals outputted from the comparison circuit fall within a preset acceptable range and outputting a signal indicating a true bank note when the signals fall within the acceptable range.

Detailed Description of the Utility Model

The present utility model relates to a bank note discriminating device used in an automatic vending machine or money-changing machine for changing bank notes into coins and, more specifically, to a bank note discriminating device that identifies monochromatic photocopied counterfeit bank notes by detecting the red seal and the underlying area surrounding the red seal.

Counterfeit bank notes for use in automatic vending machines and money-changing machines could conceivably be made using a monochromatic photocopier (e.g., a Xerox machine or blueprint copier). A method for detecting these counterfeit bank

notes has been developed in which reflected light is measured at various spots on a bank note to detect a difference in ink concentration. However, this method has difficulty differentiating real bank notes from counterfeit bank notes made with a monochromatic photocopier.

In light of this problem, the purpose of the present utility model is to provide a bank note discriminating device that is able to accurately differentiate between real bank notes and counterfeit bank notes made with a monochromatic photocopier.

The following is an explanation of a working example of the present utility mode with reference to the drawings. The red seal P on the bank note B to be differentiated and the underlying area Q surrounding the red seal P are found, and light is illuminated on these sections P, Q from a light source L so the light is distributed evenly. Optics S1, S2 are configured to cover the red seal P and the underlying area Q, the red seal P and the underlying area Q are illuminated with the same amount of light from the light source L, and the reflected light is collected. The optics S1, S2 consist of filters F1, F2 and light-receiving elements E1, E2, and the light-receiving elements E1, E2 are connected to a differential amplifier and comparison circuit D. The signals from the comparison circuit D are inputted to determining circuit C, which consists of an upper limit determining circuit C1 and lower limit determining circuit C2. The signals from upper limit determining circuit C1 and lower limit determining circuit C2 are inputted to AND circuit A, and determining signals are outputted. The filters F1, F2 remove the red light.

When the signals outputted from light-receiving elements E1 and E2 are V1 and V2, the signal V1-V2 is outputted from the comparison circuit D. The upper limit and the lower limit are detected by upper limit determining circuit C1 and lower limit determining circuit C2, and the AND circuit A is operated to output a determining signal when the signals are within an acceptable range.

The red seal P consists of the seal P1 and the seal underlying area P2. The surrounding underlying area Q is the same as the seal underlying area P2. (See FIG 3.) When the red light from the seal P1 on a real bank note is removed by the filter F1, only the reflected light from the seal underlying area P2 reaches the light-receiving element E1. Because the seal underlying area P2 and the surrounding underlying area Q are the same, the amount of light received by the light-receiving elements E1, E2 is nearly identical. As a result, V1-V2 is almost zero. (It never actually reaches zero because of wrinkles and other blemishes.) Because counterfeit bank notes made on a monochromatic photocopier using a real bank note are black or blue, the seal P1 is black or dark blue and the reflected light passes through the filter F1. Because the seal underlying area P2 and the surrounding underlying area Q are nearly white, the amount of light received by the light-receiving elements E1, E2 is very different. If the seal P1 on the monochromatic counterfeit bank note is colored in using a red pen or felt-tip marker, the red light is removed by the filter F1 but the underlying black or dark blue reflected light passes through the filter F1. As a result, the amount of light received by the light-receiving elements E1, E2 is very different. In other words, V1-V2 does not equal zero.

The range for V1-V2 is set using real bank notes in the denominations used by the machine. The upper limit Vmcx and the lower limit Vmin are set to clearly recognize bank notes in other denominations and counterfeit bank notes. If the following criteria are met, the AND circuit outputs a positive identification signal.

Determining Criteria

$$V_{min} < V_1 - V_2 < V_{max}$$

In the present utility model, the light reflected from the red seal and the surrounding underlying area is passed through red filters and received by light-receiving elements, and the difference in the light received is used to identify the bank note. If the difference in the light received is almost zero, the bank note is real. If the difference in the light received is significant, the bank note is a monochromatic counterfeit with or without a red seal. Because the underlying surrounding area is checked along with the red seal on the bank note, counterfeit bank notes are readily identified. While the red seal looks the same as the red seal on a real bank note, it is difficult to create a forgery in which the surrounding underlying area looks the same as an actual bank note. As a result, counterfeit bank notes are easier to discover.

Brief Explanation of the Drawings

FIG 1 is a block diagram of the bank note discriminating method in a working example of the present utility model. FIG 2 is a drawing used to explain the checked portion of a bank note. FIG 3 is an enlarged view of the checked portion of the bank note.

FIG 1

FIG 2

FIG 3